

11-30-05

ZJW

**Response to Office Action**

( Office Action Mailed by Patent Office on 06/02/2005; Three (3) Months Extension Requested on 8/25/2005 via Phone, Fax, and Post Mail. Payment received by US PTO and confirmed by Ms. Wynette Stapor of US PTO)

From:

Dr. Jian H. Zhao

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To:

Tan Tran

Commissioner for Patents

P.O. Box 1450

Alexandria, Virginia 22313-1450

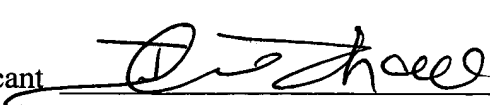
Date: August 25, 2005

Re: Office Action for Application No. 10/671,233

In response to your Detailed Action (see attached for your convenience),

1. I have signed by myself the attached Election Restriction on the bottom of the page as requested because I am not using an attorney.
2. All relevant information and prior arts have been cited on form PTO-1449 which is attached (both patent and non-patent forms).
3. A new title "Power Junction Field Effect Transistor with Highly Vertical Channel and Uniform Channel Opening" has been chosen.
4. As requested, drawings have been revised into a 3-dimentional figure so as to be able to show every feature of the invention specified in the claims. No new matter has been entered. More specifically, Fig.8 in the original filing is to be replaced by the attached 3-dimentional figure 8 as well as 2-dimenstional figures 8 (a), (b), and (c) which together reveal all the features in the claim. More specifically and in detail,
  - (i) "The four sides" of said mesa 65 are now clearly shown in the 3-dimensional figure 8(c), attached with this reply, where mesa 65 is shown to be surrounded on all four sides by the p<sup>+</sup> gate region 90.
  - (ii) U-shaped pn junction 85, as shown in attached 3-dimentional figure 8 as well as the 2-dimentional cross sectional view of figure 8(b), is shown to have "selectively and heavily doped" p<sup>++</sup> region 80 on the "bottom of said U-shaped pn junction.

- (iii) "Gate ohmic contacts" **100**, formed the surface **95** of said selectively and heavily doped  $p^{++}$  **80**, are now shown in figures 8, 8(a), and (b).
  - (iv) "Said U-shaped junctions having ohmic contacts ..." in claim 1 has a typo. It should read "Said U-shaped junctions having *said gate* ohmic contacts ...".
  - (v) "a top source layer" in line 31 is a typo and should be replaced by "*said* source layer". This "said source layer" is labeled as 60 and shown in figure 8.
5. Figs.1-7 have been designated by a legend of "Prior Art".
  6. (i) "Said U-shaped pn junction having selectively and heavily doped regions formed on the bottom of said U-shaped pn-junctions for the formation of gate ohmic contacts" is now clearly defined and shown in the corrected figures.  
(ii) Line 31, "a top source layer" is a typo and should be corrected to "said source layer".
  7. Original Fig.9 has been replaced by the attached Fig.9 to show the full U-shaped cell instead of half-cell structure at the stage of gate implantation. No new matter is added.
  8. Listed below shows corrections to the main text of ***Detailed Description of the Preferred Embodiments*** to reflect the correction of typos and corrected figures:
    - (i) Line 20 of ***Detailed Description of the Preferred Embodiment***: "the deep U-shaped trench **75** (note: only half of the U-shaped trench is shown)" should be replaced by "the deep U-shaped trench **75**" because in the corrected figure, full U-shaped trench instead of half U-shaped trench is shown.
    - (ii) Line 24 of ***Detailed Description of the Preferred Embodiment***: "higher, to form the highly vertical  $p^{+}$  gate **90** which defines a highly vertical channel **50**" should be replaced by "higher, to form the highly vertical  $p^{+}$  gate **90** which surrounds the four sides of the mesa **65** and defines a highly vertical channel formed by channel layer **50**".
    - (iii) Line 27 of ***Detailed Description of the Preferred Embodiment***: "acceptor implantation; the  $p^{++}$  region of **80** which is for better ohmic contact and is" should be replaced by : "acceptor implantation; the  $p^{++}$  selectively and heavily doped region **80** is for better gate ohmic contact formation".
    - (iv) Line 29 of ***Detailed Description of the Preferred Embodiment***: "**95**; the metal ohmic contact **100** to the  $p^{++}$  region **80**, which is internally connected to" should be replaced by "**95**; the gate ohmic contact **100** to the  $p^{++}$  region **80**, which is internally connected to".

Signature of Applicant  and date 11/27/05

(Note: Applicant is filing the application by himself, no attorney is hired. Note also the change of home address for future communication effective immediately.)

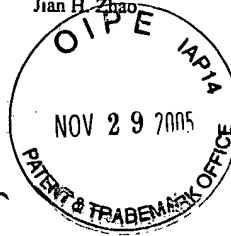


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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/671,233	09/25/2003	Jian H. Zhao		8199

7590 06/02/2005  
Jian H. Zhao  
414 Nimitz Place  
North Brunswick, NJ 08902



EXAMINER	
TRAN, TAN N	
ART UNIT	PAPER NUMBER
2826	

DATE MAILED: 06/02/2005

→ New Address is  
35 Ireland Brook Drive  
North Brunswick, NJ 08902

Please find below and/or attached an Office communication concerning this application or proceeding.



## Office Action Summary

Application No.

10/671,233

Applicant(s)

ZHAO, JIAN H.

Examiner

TAN N. TRAN

Art Unit

2826

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on response filed on 03/21/05.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-4 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

*Minhloan Tran*  
Minhloan Tran  
Primary Examiner  
Art Unit 2826

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09/25/03 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(e).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Election/Restrictions*

*done* ✓ 1. Applicant's election of Species A, figs.8,9, claims 1-4 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Note applicant's attorney should sign on the bottom of response of election restriction requirement filed 03/21/05. Appropriate correction is required. — *did not have an attorney*

### Information Disclosure Statement

*done* ✓ 2. If applicant is aware of any relevant prior art, he/she requested to cite it on form PTO-1449 in accordance with the guidelines set forth in M.P.E.P. 609.

### Specification

*done* ✓ 3. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

### Drawings

*done* ✓ 4. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, said mesas surrounded on the four sides; said U-shaped pn junction having selectively and heavily doped regions formed on the

bottom of said U-shaped pn junctions for the formation of gate ohmic contacts; said U-shaped junctions having ohmic contacts; and said semiconductor structure having a top source layer as recited in claim 1 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

*done* ✓ 5. Figures 1-7 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

**Claim Rejections - 35 USC § 112**

*done* ✓ 6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-4 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 1, lines 19,20, "said U-shaped pn junction having selectively and heavily doped regions formed on the bottom of said U-shaped pn junctions for the formation of gate ohmic contacts" is unclear as to what does applicant mean by said U-shaped pn junction having

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selectively and heavily doped regions formed on the bottom of said U-shaped pn junctions for the formation of gate ohmic contacts?

line 31, "a top source layer" is unclear as to whether it is being referred to the top source layer as a top layer as source layer of said transistor as recited in lines 6,7 of claim 1.

### **Conclusion**

7. Any inquiry concerning this communication or earlier communication from the examiner should be directed to Tan Tran whose telephone number is (571) 272-1923. The examiner can normally be reached on M-F 8:30AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on (571) 272-1915. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9306 for regular communications and (703) 872-9306 for after final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

TT

May 2005



## Acknowledgement of Receipt

From:  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450

To:  
Jian H. Zhao  
35 Ireland Brook Drive  
North Brunswick, NJ 08902

This is to acknowledge the receipt of your reply to the Office Action dated 06/02/2005 including corrected figures.

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Signature or Seal

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Date

USPTO Received the Following on \_\_\_\_\_

1. Two pages response to Office Action
  2. Five pages corrected figures
  3. One page make-up signature page
  4. Two pages PTO/SB/08A and 08B
  5. Copy of Office Action dated 6/2/2005
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